

CLAIM AMENDMENTS

1. (Original) Use of a biological photoreceptor as a light-controlled ion channel for the alteration of the ion conductivity of a membrane with the aid of light, wherein the photoreceptor used comprises an apoprotein and a light-sensitive polyene covalently bound to the apoprotein, said polyene interacting with the apoprotein and functioning as a light-sensitive gate.
2. (Original) Use according to Claim 1, characterised in that the apoprotein is a transmembrane protein with 5 or more transmembrane helices.
3. (Currently Amended) Use according to Claim 1 ~~or 2~~, characterised in that the ion transport system is a proton transport system.
4. (Currently Amended) Use according to ~~one of Claims 1 to 3~~ Claim 1, characterised in that the apoprotein is an opsin protein or a derivative or fragment of a naturally occurring opsin protein.
5. (Original) Use according to Claim 4, characterised in that the opsin derivative or fragment is the result of an exchange and/or an insertion and/or deletion of one or several amino acid(s) in the natural amino acid sequence of the opsin protein.
6. (Currently Amended) Use according to ~~one of Claims 1 to 5~~ Claim 1, characterised in that the amino acid corresponding to the bacteriorhodopsin Asp⁹⁶ is an amino acid other than Asp and in the apoprotein at least 8 of the other 16 amino acids which are involved in the proton transport network in bacteriorhodopsin are identically retained or modified by conservative exchange.
7. (Currently Amended) Use according to ~~one of Claims 1 to 6~~ Claim 1, characterised in that at least the amino acids which in bacteriorhodopsin correspond to the amino acids T⁴⁶, Y⁵⁷, R⁸², T⁸⁹, T¹⁰⁷, W¹⁸², D²¹² and K²¹⁶ are identically retained at the corresponding position.

8. (Currently Amended) Use according to ~~one of Claims 1 to 7~~ Claim 1, characterised in that the apoprotein contains the consensus sequence L(I)DxxxKxxW(F,Y).

9. (Currently Amended) Use according to ~~one of Claims 1 to 8~~ Claim 1, characterised in that the apoprotein derives from lower plants.

10. (Original) Use according to Claim 9, characterised in that the lower plants are algae.

11. (Original) Use according to Claim 10, characterised in that the apoprotein is an opsin protein from *Chlamydomonas reinhardtii*.

12. (Currently Amended) Use according to ~~one of Claims 1 to 11~~ Claim 1, characterised in that the apoprotein includes at least the amino acids 61 to 310 of the Channelopsin1 (CHOP-1) according to SEQ ID NO:AF385748 (National Center for Biotechnology Information, NCBI).

13. (Currently Amended) Use according to ~~one of Claims 1 to 11~~ Claim 1, characterised in that the apoprotein includes at least the amino acids 24 to 268 of the Channelopsin2 (CHOP-2) according to SEQ ID NO:AF461397.

14. (Original) Use according to Claim 13, characterised in that the amino acid histidine at position 134 of the Channelopsin2 according to SEQ ID NO:AF461397 is replaced by another amino acid.

15. (Original) Use according to Claim 14, characterised in that the amino acid histidine at position 134 is replaced by arginine.

16. (Currently Amended) Use according to ~~one of Claims 4 to 8~~ Claim 4, characterised in that the opsin protein derives from protozoa.

17. (Currently Amended) Use according to ~~one of Claims 4 to 8~~ Claim 4, characterised in that the opsin protein derives from bacteria or archaea.

18. (Currently Amended) Use according to ~~one of Claims 4 to 8~~ Claim 4, characterised in that the opsin protein derives from fungi.

19. (Currently Amended) Use according to ~~one of Claims 1 to 18~~ Claim 1, characterised in that the light-sensitive polyene is a retinal or retinal derivative.

20. (Original) Use according to Claim 19, characterised in that the retinal derivative is selected from the following group: 3,4-dehydroretinal, 13-ethylretinal, 9-dm-retinal, 3-hydroxyretinal, 4-hydroxyretinal, naphthylretinal; 3,7,11-trimethyl-dodeca-2,4,6,8,10-pentaenal; 3,7-dimethyl-deca-2,4,6,8-tetraenal; 3,7-dimethyl-octa-2,4,6-trienal; and 6-7 or 8-9 or 10-11 rotation-blocked retinals.

21. (Currently Amended) Use according to ~~one of Claims 1 to 20~~ Claim 1 for the light-controlled alteration of the proton conductivity of the membrane.

22. (Currently Amended) Use according to ~~one of Claims 1 to 20~~ Claim 1 for the light-controlled alteration of the membrane potential of a cell.

23. (Currently Amended) Use according to ~~one of Claims 20 to 22~~ Claim 20, characterised in that the membrane is the cell membrane of a yeast, e.g. *Saccharomyces cerevisiae*, *Schizosaccharomyces pombe* or *Pichia pastoris*.

24. (Currently Amended) Use according to ~~one of Claims 20 to 22~~ Claim 20, characterised in that the membrane is the cell membrane of a mammalian cell or insect cell, e.g. COS, BHK, HEK293, CHO, myeloma cell, MDCK or baculovirus-infected sf9 cell.

25. (Currently Amended) Use according to ~~one of Claims 20 to 24~~ Claim 20 for the light-controlled raising or lowering of the intracellular concentration of ions.

26. (Original) Use according to Claim 25 for the light-controlled raising or lowering of the intracellular proton concentration.

27. (Currently Amended) Use according to ~~one of Claims 1 to 20~~ Claim 1 for the measurement of the intracellular proton concentration directly on the plasma membrane or of a proton concentration gradient across the plasma membrane with the aid of current-voltage curves, wherein the proton concentration gradient can be directly determined from the difference in the current-voltage curves with and without illumination from the reversal potential.

28. (Currently Amended) Use of a light-controlled ion channel according to ~~one of Claims 1 to 20~~ Claim 1 for the high throughput screening of biological molecules.

29. (Original) Use according to Claim 28 for the high throughput screening of pH-regulated membrane proteins.

30. (Original) Use according to Claim 28 for the high throughput screening of voltage-dependent membrane proteins.

31. (Currently Amended) Use according to ~~one of Claims 20 to 30~~ Claim 20, characterised in that the light-controlled ion channel is used in combination with a light-controlled active ion transport system.